

CLAIMS:

1. A process for producing plastic/wood fiber composite foamed structures comprising the steps of:
- 5 pre-drying wood fiber filler having a degradation temperature and an active volatilization temperature and maintaining the pre-drying temperature below the degradation temperature to produce dried wood fiber filler;
- 10 mixing the dried wood fiber filler with plastic to produce a plastic/wood fiber mixture and maintaining the mixing temperature below an active volatilizing temperature;
- feeding the plastic/wood fiber mixture into an extruder;
- introducing a blowing agent into the plastic/wood fiber mixture and mixing it therewith to produce a plastic/wood fiber/gas mixture;
- 15 subjecting the plastic/wood fiber/gas mixture to high shear forces in the presence of high pressures and maintaining the processing temperature below an active volatilizing temperature; and
- extruding the plastic/wood fiber/gas mixture to produce a plastic/wood fiber composite foamed structure.
- 20 2. A process as claimed in claim 1 wherein the pre-drying temperature is between the active volatilization temperature and the degradation temperature.

3. A process as claimed in claim 1 wherein the pre-drying temperature is below 180°C.
- 5 4. A process as claimed in claim 3 wherein the mixing temperature is below 170°C.
5. A process as claimed in claim 4 wherein the processing temperature is below 170°C.
- 10 6. A process as claimed in claim 1 wherein the mixing temperature is below 170°C.
7. A process as claimed in claim 1 wherein the processing temperature is below 170°C.
- 15 8. A process as claimed in claim 1 wherein the blowing agent is volatiles devolved from the wood fiber during the mixing step and the subjecting step.
9. A process as claimed in claim 1 wherein the blowing agent is a physical blowing agent.
- 20 10. A process as claimed in claim 9 wherein the physical blowing agent is chosen from the group consisting of any of the non-reactive gases such as CO₂, N₂, He,

Ar, Air, or a mixture of thereof.

11. A process as claimed in claim 1 wherein the blowing agent is a chemical blowing agent.

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12. A process as claimed in claim 5 wherein the blowing agent is volatiles devolved from the wood fiber during the mixing step and the subjecting step.

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13. A process as claimed in claim 5 wherein the blowing agent is a physical blowing agent.

14. A process as claimed in claim 13 wherein the physical blowing agent is chosen from the group consisting of any of the non-reactive gases such as CO₂, N₂, He, Ar, Air, or a mixture of thereof.

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15. A process as claimed in claim 5 wherein the blowing agent is a chemical blowing agent.

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16. A process as claimed in claim 1 further including the step of reducing the temperature of the plastic/wood fiber/gas mixture prior to the step of extruding thereby stabilizing the cell structure in the plastic/wood fiber/gas mixture.

17. A process as claimed in claim 16 wherein the temperature is reduced in one of a cooling extruder and a heat exchanger.
- 5 18. A process as claimed in claim 5 further including the step of reducing the temperature of the plastic/wood fiber/gas mixture prior to the step of extruding thereby stabilizing the cell structure in the plastic/wood fiber/gas mixture.
- 12/07/2001 10 19. A process as claimed in claim 18 wherein the temperature is reduced in one of a cooling extruder and a heat exchanger.
- 20 20. A process as claimed in claim 8 further including the step of reducing the temperature of the plastic/wood fiber/gas mixture prior to the step of extruding thereby stabilizing the cell structure in the plastic/wood fiber/gas mixture.
- 15 21. A process as claimed in claim 20 wherein the temperature is reduced in one of a cooling extruder and a heat exchanger.
- 20 22. A process as claimed in claim 9 further including the step of reducing the temperature of the plastic/wood fiber/gas mixture prior to the step of extruding thereby stabilizing the cell structure in the plastic/wood fiber/gas mixture.
23. A process as claimed in claim 22 wherein the temperature is reduced in one of a

cooling extruder and a heat exchanger.

- 5 24. A process as claimed in claim 11 further including the step of reducing the temperature of the plastic/wood fiber/gas mixture prior to the step of extruding thereby stabilizing the cell structure in the plastic/wood fiber/gas mixture.
25. A process as claimed in claim 24 wherein the temperature is reduced in one of a cooling extruder and a heat exchanger.
- 10 26. A process as claimed in claim 1 wherein the extruder includes cascade devolatization having a first cascade extruder and a second cascade extruder.
- 15 27. A process as claimed in claim 26 wherein the first cascade extruder is one of a twin screw extruder and a single screw extruder and the second cascade extruder is one of a twin screw extruder and a single screw extruder.
28. A process as claimed in claim 5 wherein the extruder includes cascade devolatization having a first cascade extruder and a second cascade extruder.
- 20 29. A process as claimed in claim 28 wherein the first cascade extruder is one of a twin screw extruder and a single screw extruder and the second cascade extruder is one of a twin screw extruder and a single screw extruder.

30. A process as claimed in claim 8 wherein the extruder includes cascade devolatization having a first cascade extruder and a second cascade extruder.

5 31. A process as claimed in claim 30 wherein the first cascade extruder is one of a twin screw extruder and a single screw extruder and the second cascade extruder is one of a twin screw extruder and a single screw extruder.

10 32. A process as claimed in claim 9 wherein the extruder includes cascade devolatization having a first cascade extruder and a second cascade extruder.

15 33. A process as claimed in claim 32 wherein the first cascade extruder is one of a twin screw extruder and a single screw extruder and the second cascade extruder is one of a twin screw extruder and a single screw extruder.

34. A process as claimed in claim 11 wherein the extruder includes cascade devolatization having a first cascade extruder and a second cascade extruder.

20 35. A process as claimed in claim 34 wherein the first cascade extruder is one of a twin screw extruder and a single screw extruder and the second cascade extruder is one of a twin screw extruder and a single screw extruder.

36. A process as claimed in claim 16 wherein the extruder includes cascade devolatization having a first cascade extruder and a second cascade extruder.
- 5 37. A process as claimed in claim 37 wherein the first cascade extruder is one of a twin screw extruder and a single screw extruder and the second cascade extruder is one of a twin screw extruder and a single screw extruder.
- 10 38. A process as claimed in claim 18 wherein the extruder includes cascade devolatization having a first cascade extruder and a second cascade extruder.
39. A process as claimed in claim 38 wherein the first cascade extruder is one of a twin screw extruder and a single screw extruder and the second cascade extruder is one of a twin screw extruder and a single screw extruder.
- 15 40. A process as claimed in claim 20 wherein the extruder includes cascade devolatization having a first cascade extruder and a second cascade extruder.
- 20 41. A process as claimed in claim 40 wherein the first cascade extruder is one of a twin screw extruder and a single screw extruder and the second cascade extruder is one of a twin screw extruder and a single screw extruder.
42. A process as claimed in claim 22 wherein the extruder includes cascade

devolatization having a first cascade extruder and a second cascade extruder.

43. A process as claimed in claim 42 wherein the first cascade extruder is one of a twin screw extruder and a single screw extruder and the second cascade extruder is one of a twin screw extruder and a single screw extruder.

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44. A process as claimed in claim 24 wherein the extruder includes cascade devolatization having a first cascade extruder and a second cascade extruder.

45. A process as claimed in claim 44 wherein the first cascade extruder is one of a twin screw extruder and a single screw extruder and the second cascade extruder is one of a twin screw extruder and a single screw extruder.

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46. A process as claimed in claim 1 wherein the extruder is one of a twin screw extruder and a single screw extruder.

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47. A process as claimed in claim 5 wherein the extruder is one of a twin screw extruder and a single screw extruder.

48. A process as claimed in claim 8 wherein the extruder is one of a twin screw extruder and a single screw extruder.

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49. A process as claimed in claim 9 wherein the extruder is one of a twin screw extruder and a single screw extruder.
50. A process as claimed in claim 11 wherein the extruder is one of a twin screw extruder and a single screw extruder.
51. A process as claimed in claim 16 wherein the extruder is one of a twin screw extruder and a single screw extruder.
52. A process as claimed in claim 18 wherein the extruder is one of a twin screw extruder and a single screw extruder.
53. A process as claimed in claim 20 wherein the extruder is one of a twin screw extruder and a single screw extruder.
54. A process as claimed in claim 22 wherein the extruder is one of a twin screw extruder and a single screw extruder.
55. A process as claimed in claim 24 wherein the extruder is one of a twin screw extruder and a single screw extruder.
56. A process as claimed in claim 26 wherein the extruder is one of a twin screw

extruder and a single screw extruder.

57. A process as claimed in claim 28 wherein the extruder is one of a twin screw extruder and a single screw extruder.

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58. A process as claimed in claim 30 wherein the extruder is one of a twin screw extruder and a single screw extruder.

59. A process as claimed in claim 32 wherein the extruder is one of a twin screw extruder and a single screw extruder.

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60. A process as claimed in claim 34 wherein the extruder is one of a twin screw extruder and a single screw extruder.

- 15 61. A process as claimed in claim 36 wherein the extruder is one of a twin screw extruder and a single screw extruder.

62. A process as claimed in claim 38 wherein the extruder is one of a twin screw extruder and a single screw extruder.

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63. A process as claimed in claim 40 wherein the extruder is one of a twin screw extruder and a single screw extruder.

64. A process as claimed in claim 42 wherein the extruder is one of a twin screw extruder and a single screw extruder.
- 5 65. A process as claimed in claim 44 wherein the extruder is one of a twin screw extruder and a single screw extruder.
66. A process for producing plastic/wood fiber composite foamed structures comprising the steps of:
- 10 pre-drying wood fiber filler to produce dried wood fiber filler;
- mixing the dried wood fiber filler with plastic to produce a plastic/wood fiber mixture;
- feeding the plastic/wood fiber mixture into an extruder;
- mixing a physical blowing agent into the plastic/wood fiber mixture to produce a
- 15 plastic/wood fiber/gas mixture;
- subjecting the plastic/wood fiber/gas mixture to high shear forces in the presence of high pressures; and
- extruding the plastic/wood fiber/gas mixture to produce a plastic/wood fiber composite foamed structure.
- 20 67. A process as claimed in claim 66 further including the step of reducing the temperature of the plastic/wood fiber/gas mixture prior to the step of extruding

thereby stabilizing the cell structure in the plastic/wood fiber/gas mixture.

68. A process as claimed in claim 67 wherein the physical blowing agent is chosen from the group consisting of CO₂ and N₂.